भारतीय मानक
Indian Standard

IS 16531 : 2022

बायोडीजल, डीजल ईंधन मिश्रण (बी 8 से बी 20 के लिए) — विशिष्टि

(पहला पुनरीक्षण)

Biodiesel, Diesel Fuel Blend (B 8 to B 20) — Specification

(First Revision)

ICS 75.160.20

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January 2022 **Price Group 5**

Petroleum and Their Related Products of Synthesis or Biological Origin Sectional Committee, PCD 03

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Petroleum and Their Related Products of Synthesis or Biological Origin Sectional Committee was approved by the Petroleum, Coal and Related Products Division Council.

The High Speed Diesel (HSD) fuel continues to be the main fuel in our country for public and commercial transport. This trend is expected to continue with demands to maximize its production to cater to the ever-increasing requirements of consumers.

At national level, the major part of the demand is met through import of crude from diverse sources as the domestic crude oil can meet only about 20 percent of the demand. Renewable energy sources are indigenous, nonpolluting and virtually inexhaustible and India is endowed with abundant renewable energy sources. Therefore, their use is required to be encouraged in all possible ways. Biodiesel (Fatty Acid Methyl Ester -FAME) is one such renewable and alternative fuel which can be used as standalone or its blend in diesel fuel as clean fuel.

This standard was initially published in 2016, when blending of biodiesel in Automotive diesel fuel meeting IS 1460 : 2005 version, was permitted up to 5 percent v/v, considering that it does not have any adverse effect at this concentration in existing diesel engines. Accordingly, the requirements of B6 to B20 diesel fuel for suitably designed vehicles meeting Bharat Stage III and Bharat Stage IV Emission Norms were furnished in Table l. A test method for estimating Bio-diesel (FAME) content was stipulated in Annex B, which was developed on six Bio-diesel samples (karanjia, soyabean, Jatropa, ricebran and palm oil). Since the absorptivity of all the Bio-diesel is found to be almost same (205-217), the method is independent of the nature of the bio diesel.

In order to accommodate the use of higher proportion of Bio-diesel in diesel fuel blends (B6 to B20) meant for automotive and non-automotive applications, a separate standard for B6 to B20 blend diesel fuel specification was published, as higher concentration of Bio-diesel in diesel fuel could have significant impact on some properties of mineral diesel fuel. Since Bio-diesel is very clean fuel with less than 10 ppm of sulfur it is envisaged that this fuel would significantly reduce the vehicular emissions.

The properties of commercial B6 to B20 blends depend on the refining practices employed and the nature of the diesel fuel and biodiesel from which they are produced. Diesel fuel may be produced within the boiling range of 150 °C and 400 °C having many possible combinations of various properties, such as volatility, ignition quality, viscosity, and other characteristics. Biodiesel, for example, can be produced from a variety of animal fats or vegetable oils that produce similar volatility characteristics and combustion emissions with varying cold flow properties.

In this first revision, requirements for Bharat stage III (BS III) and Bharat Stage IV (BS IV) automotive diesel fuel have been deleted and that of Bharat stage VI (BS VI) have been included. Biodiesel produced from Used Cooking Oil (UCO) is included along with existing source of variety of vegetable oils and animal fats. Minimum percentage of blending has been modified from 6 to 8 percent, as the latest revision of IS 1460 in 2017 included up to 7 percent blending in automotive diesel fuels, in accordance to Extraordinary Gazette Notification No. 651 dated 16th September 2016 Central Motor Vehicles (11th Amendment) Rules, 2016 issued by Ministry of Road Transport and Highways.

This specification now includes blends having minimum 8 percent (*v*/*v*) and up to 20 percent (*v*/*v*) of Biodiesel (Fatty Acid Methyl Ester-FAME) in diesel fuel for use in captive fleet application for designated vehicles and for non-automotive applications, where such fuels are recommended. This fuel is not suitable for all vehicles/diesel engines, consult vehicle/engine manufacturers or user manual before use. Accordingly, the requirements of B 8 to B 20 diesel fuel for suitably designed vehicles meeting Bharat Stage VI Emission Norms are furnished in Table l. Appearance test parameter is incorporated in the Table. The requirements of sulphur, poly aromatic hydrocarbons, distillation and acid number are modified. Biodiesel content has been modified as FAME content. The test method for estimating FAME content by FTIR technique has been incorporated in Table 1 in view of this separate Annex B is not required and hence deleted.

(*Continued on third cover*)

Indian Standard

BIODIESEL, DIESEL FUEL BLEND (B 8 TO B 20) — SPECIFICATION

(First Revision)

1 SCOPE

This specification prescribes the requirements, sampling procedure and test methods for B8-B20 biodiesel, diesel fuel blend [8 to 20 percent (*v*/*v*) of Bio-diesel fuel complying with IS 15607 and Automotive Diesel Fuel complying with IS 1460], under BS VI category, applicable for use in suitably designed automotive and non-automotive engines.

> WARNING — This draft standard does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to the application of the standard, and to determine the applicability of regulatory limitations and any other restrictions for this purpose.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No	*Title*
1260 (Part 1) : 1973	Pictorial marking for handling and labeling of goods: Part 1 Dangerous goods (*first revision*)
1460 : 2017	Automotive diesel fuel — Specification (*sixth revision*)
1447 (Part 1) : 2000	Petroleum and its products — Methods of sampling: Part 1 Manual sampling (*first revision*)
1448	Methods of test for petroleum and its products
(Part 2) : 2007/ ISO 6619 : 1988	Petroleum products and lubricants — Neutralization number — Potentiometric titration method (*second revision*)
(Part 4/Sec 1) : 2008/ISO 6245 : 2001	Ash, sulphated ash and water soluble ash (*third revision*)
(Part 8) : 2012/ ISO 4262 : 1993	Carbon residue by Ramsbottom method (*first revision*)
(Part 9) : 2019/ ISO 5165 : 2017	Cetane number (*first revision*)
(Part 12) : 2013/ ISO 2049 : 1996	Colour by ASTM colour scale (*first revision*)
(Part 15) : 2004/ ISO 2160 : 1998	Corrosiveness to copper — Copper strip test (*third revision*)
(Part 16) : 2014/ ISO 3675 : 1998	Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method (*fourth revision*)
(Part 18) : 2020	Distillation of petroleum products (*second revision*)
(Part 20) : 2019/ ISO 13736 : 2013	Determination of flash point — Abel closed — Cup method (*third revision*)
(Part 21) : 2019/ ISO 2719 : 2016	Determination of flash point — Pensky — Martens closed cup method (*fourth revision*)
(Part 25/Sec 1) : 2018/ ISO 3014 : 1994	Transparent and opaque liquids — Section 1 Determination of kinematic viscosity and calculation of dynamic viscosity (*second revision*)
(Part 32) : 2019/ ISO 3838 : 2004	Crude petroleum and liquid or solid petroleum products — Determination of density or relative density — Capillary stoppered pyknometer and graduated bicapillary pyknometer methods (*third revision*)

IS No	*Title*
(Part 110) : 1981	Determination of cold filter plugging point of distillate fuels
(Part 149) : 2020/ ISO 12156-1 : 2018	Diesel fuel — Assessment of lubricity using the high frequency reciprocating rig (HFRR) — Test method (*second revision*)
(Part 159) : 2018/ ISO 20884 : 2011	Determination of sulphur content of automotive fuels — Wavelength — dispersive x-ray fluorescence spectrometry
(Part 160) : 2017/ ISO 20846 : 2011	Determination of sulphur content of automotive fuels — Ultraviolet fluorescence method
(Part 161) : 2017/ ISO 13032 : 2012	Determination of low concentration of sulphur in automotive fuels — Energy — dispersive x – ray fluorescence spectrometric method
(Part 167) : 2018/ ISO 12185 : 1996	Determination of density — Oscillating U-tube method
(Part 174) : 2020/ ISO 4264 : 2018	Petroleum Products — Calculation of cetane index of middle-distillate fuels by the four variable equation
(Part 175) : 2020/ ISO 6296 : 2000	Petroleum products — Determination of water — Potentiometric Karl Fischer titration method
(Part 176) : 2020/ ISO 7537 : 1997	Petroleum Products — Determination of acid number — Semi-micro colour indicator titration method
(Part 182) : 2020/ ISO 12937 : 2000	Petroleum Products — Determination of water — Coulometric Karl Fischer titration method
ISO 3679 : 2015	Determination of flash no-flash and flash point — Rapid equilibrium closed cup method
ISO 13759	Petroleum products — Determination of alkyl nitrate in diesel fuels — Spectrometric method

3 REQUIREMENTS

3.1 General

3.1.1 The blended fuel shall comprise of 80 to 92 volume percent of diesel fuel meeting IS 1460 specification and 8 to 20 volume percent of biodiesel meeting IS 15607 specification.

3.1.2 The use of fuel additives is permitted in order to improve the performance quality. Suitable fuel additives without known harmful side-effects are recommended in appropriate concentration that help to avoid deterioration of drivability and emissions control durability. Antioxidant/Stabilizing agents, as required, shall be incorporated.

3.1.3 The biodiesel blend (B8 to B20) shall be visually free of undissolved water, sediment and suspended matter.

3.1.4 The use of approved dye or marker is permitted if required by statutory agencies.

3.2 The fuel shall also comply with the requirements given in Table 1when tested according to the methods prescribed in col 4 and 5 of Table 1.

4 PACKING AND MARKING

4.1 Packing

The fuel shall be packed and supplied in suitable containers as agreed to between the purchaser and the supplier and subject to the provision of Red Tariff No. 18 Rules and Rates for the Conveyance by Rail of Explosives and Other Dangerous Goods, issued by the Indian Railway Conference Association, with any alternations or additions made thereafter. Shipping and Handling regulations laid down by Petroleum and Explosives Safety Organization (PESO) time to time shall be followed.

4.2 Marking

4.2.1 Each container shall be marked with the following information:

a) Name of the material;
b) Indication of the source of manufacture, initials or trademark, if any;
c) Volume of the contents, in liters;
d) Declaration of blend content;
e) Lot/Batch No;
f) Month and year of manufacture or packing; and
g) The Caution label 'FLAMMABLE' together with the corresponding symbol for labeling dangerous goods as given in Fig. 5 of IS 1260 (Part l).

4.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

5 SAMPLING

Representative samples of the material shall be drawn as prescribed in IS 1447 (Part 1).

6. QUALITY ASSUARANCE

6.1 It is essential that refineries ensure batches are homogeneous, test results are representative of product supplied. Similarly blending locations (at which the biodiesel blending happens) shall ensure that both the bio-diesel and Automotive diesel are meeting IS 15607 and IS 1460 respectively, prior to B8 to B20 blending and the results are representative of the admixture complying Table 1.

6.2 In case of online blending process, Oil Marketing Company (OMC) shall ensure the blended product meets the requirements given in Table 1.

6.3 In case of in-tank blending process, the minimum marking details to be shown on the fuel’s batch test certificate of quality at point of manufacture are as under:

a) Specification name, issue and any amendment number;

b) Name and address of testing laboratory;

c) Batch number or unique identifier;

d) Properties tested including specification limit, test method and result of test;

e) Identification of the signatory certifying the report; and

f) Date of certification.

Table 1 Requirement for Biodiesel, Diesel Fuel Blend (B8 to B20)

(*Clauses* 3.1.5, 3.2 *and* 6.4)

Sl No.	Characteristics	Requirements	Method of Test, Ref to Part of 1448/ISO/ASTM D/EN
(1)	(2)	(3)	(4)
i)	Appearance	Clear, bright and free from sediments, suspended matter and undissolved water at normal ambient fuel temperature	Visual
ii)	Density at 15 °C, kg/m^3	820 to 860	(Part 16)/ (Part 32)/(Part 167)[1]
iii)	Kinematic viscosity @ 40 °C, mm^2/s	2.0 to 4.62	(Part 25/Sec 1)
iv)	Flash point[4], Abel, ^{0}C, *Min*	35	(Part 20)[1]/(Part 21)
v)	Total sulphur, mg/kg, *Max*	10	(Part 159)/(Part 160)/(Part 161)[1]
vi)	Ramsbottom or micro Carbon residue[2] on 10 percent residue, percent by mass, *Max*	0.3	(Part 8)[1] /ISO 10370
vii)	Ash content, percent by mass, *Max*	0.01	(Part 4/Sec 1)
viii)	Water content, mg/kg, *Max*	260	(Part 175)/(Part 182)[1]
ix)	Cu strip corrosion for 3h at 50°C, rating	Not worse than No. 1	(Part 15)
x)	Cetane Number, *Min*	51	(Part 9)
xi)	Cetane index, *Min*	46	(Part 174)
xii)	PAH, m/m, *Max*	8.0	EN 12916
xiii)	Lubricity, wear scar diameter (wsd1.4) at 60 °C, micron, *Max*	460	(Part 149)
xiv)	Acid number, mg of KOH/gm *Max*	0.3	(Part 2)/(Part 176)
xv)	Oxidation stability by Rancidity meter, at 110 °C, hours, *Min.*	20	EN15751
xvi)	Distillation,		(Part 18) [1]/ISO 3405
	a) percent (*v*/*v*) recovered at 250 °C, *Max.*	65	
	b) percent (*v*/*v*) recovered at 350 °C, *Min*.	85	
	c) 95 percent (*v*/*v*) recovery at °C, *Max*.	360	
xvii)	FAME Content percent *v/v*	8 to 20	EN 14078/D 7371
xviii)	Cold filter plugging point (CFPP)[3], °C, *Max.*		(Part 110)
	Winter	6	
	Summer	18	
xix)	Total contaminant, mg/kg *Max.*	24	EN12662

NOTES

[1] In case of dispute, this test shall be the referee test method.

[2] This limit is applicable prior to addition of ignition improvers, if used. In case a value exceeding the limit is obtained on finished fuels in the market, ASTM D 4046/ISO 13759 shall be used to establish the presence of nitrate containing compound. In such case the present limit for carbon residue cannot be applied. However, the use or ignition improver does not exempt the manufacturer from meeting this requirement prior to the addition or additives.

[3] Winter shall be the period from November to February in central and northern plains of India (both months inclusive) and rest of the months of the year shall be called as summer.

[4] In case flash point exceeds 66 °C, PMCC Flash point by IS 1448 Part 21 method shall be used.

ANNEX A

(*Foreword*)

The following alternate test methods exists for the characteristics given in Table 1.

Characteristics	Alternate Test Method ASTM / IP/EN
Density at 15 °C	D 4052/D 1298/IP160
Kinematic viscosity, cSt at 40 °C	D 445/D 7042/IP 71
Flash point, Abel, °C	IP 170/IP 523/EN 13736
Flash point, PMCC, °C	IP 34/D 93
Total sulphur, mg/kg	D 2622/D 7220
Carbon residue (Ramsbottom or micro method) on 10 percent residue, percent by mass	D 4530/D 524/IP 14
Ash content, percent by mass	D 482/IP 4
Water Content, ppm	D-6304
Cu corrosion for 3h at 500 C, rating	D 130/IP 154
Cetane No.	D 613
Cetane index	D 4737/IP 380
PAH, m/m	IP 391/D 6591
Acid No., mg of KOH/gm	D 974/D 664
Distillation	D 86/D 7345/IP 123
Oxidation stability by Rancidity meter	EN 15751
Cold filter plugging point (CFPP), °C,	EN 16329/D 6371/IP 309
Total contaminant, mg/kg	IP 440

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Petroleum and Their Related Products of Synthesis or Biological Origin Sectional Committee, PCD 03

Organization	*Representative(s)*
Indian Institute of Technology, Delhi	Prof L. M. DAS (***Chairman***)
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Bosch Ltd, Bengaluru	Shri A. Fredrick Shri D. Ramaraju (*Alternate*)
Central Pollution Control Board, (Ministry of Environment & Forests), New Delhi	Shri Dinabandhu Gouda
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(*Continued from second cover*)

The alternate test methods are provided in Annex A for the characteristics stated and in case of dispute the referee method shown in the Table 1 shall be followed. Reference to the overseas standards like ISO, ASTM, etc., have been given as presently there is no Indian Standard available for them. Once the Indian Standards are formulated, the standard will be updated accordingly.

Considerable assistance has been drawn from ASTM D-7467; EN 16734 and draft European specification EN 16709, while preparing this draft standard.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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